EXTERNAL REVIEW of
NEW BRUNSWICK CARDIAC SERVICES

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ORGANIZATION OF THE REPORT

This report is organized in the following sections:

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- Approach taken to complete the report

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I. EXECUTIVE SUMMARY

An external review of cardiac care in New Brunswick was undertaken with the express purpose of recommending to the cardiology program review committee a model of service delivery which would ensure timely access to quality care to both linguistic communities. The review was undertaken at the request of the Deputy Minister of Health and Wellness to assess the services provided by the New Brunswick Heart Center and resources required.

RECOMMENDATIONS

The Review Team has made a number of recommendations they believe are critical to maintain and develop outstanding cardiac services for the province of New Brunswick. The reader is cautioned that the high level summary of key recommendations to follow must be interpreted within the context of the detailed information, recommendations and rationale documented within the full body of the report. These are the pertinent recommendations.

Recommendation 1: Burden of Cardiovascular Disease in New Brunswick

- That under the leadership of the New Brunswick Heart Center a surveillance system should be established in New Brunswick to monitor the prevalence of cardiac risk factors and cardiac related morbidity and mortality. This is perhaps best organized through the provincial epidemiology services. Furthermore a task force should be identified to plan strategies to decrease the high prevalence of cardiac risk factors in New Brunswick.

Recommendation 2: New Brunswick Cardiology Services – Provincial Perspective

- It is recommended that the New Brunswick Heart Center continue to enhance efforts to recruit bilingual health care providers. Any new services should be implemented in such a way as to ensure that they are provided in the official language of the patient's choice.

- Although electrodiagnostics and diagnostic imaging are available at many places within the province wait lists for certain non-invasive diagnostic procedures, particularly echocardiography, are unacceptably long in some of the health regions. Provincial standards need to be established with respect to what are considered acceptable waits and, once developed, these should be adhered to.

- In order to both impact the existing patient wait list and deal with increasing demand, additional echocardiography machines and technologists to run them appear to be required.

- The cardiovascular health and wellness program at the New Brunswick Heart Center is a provincial resource and needs to be adequately supported in terms of space and funding needs. This program should provide leadership in terms of establishing a province wide prevention strategy and improving province wide cardiac rehabilitation. There need to be sufficient resources for each of the regions to provide service in cardiovascular health and wellness.

Recommendation 3: New Brunswick Heart Center Services – Resources – Physician Profiles and Bed Allocation

- Physician workload at the New Brunswick Heart Center appears excessive and a manpower review seems overdue; indeed, it is the opinion of the review panel that it is as important to consider the number of non-invasive cardiologists as it is interventionalists or electrophysiologists in future planning around the program.

- Until and unless the numbers of noninvasive cardiologists can be increased, consideration should be given to lessening the workload through the use of physician extenders/assistants.

- Pre- and post-procedural care by the non-invasive cardiologists of patients referred for a percutaneous procedure has been a particular area of concern given that this work is time-consuming, poorly remunerated, and distracts from other clinical and financial opportunities. This needs urgently to be addressed through changes in the fee code associated with this service or appropriate stipends.

Recommendation 4: Cardiac Catheterization and Intervention Procedures

- The wait times for access to invasive cardiac services are overly long and all efforts must be made to correct this problem. Wait list management must occur not only for patients awaiting interventional procedures in hospital but also for outpatients. An appropriate triage system must include dedicated personnel to appropriately handle triage, to communicate with hospitals and with patients.

- Regular quality reports must be generated from the interventional laboratories regarding complications that occur during hospitalization. These reports should be referred on to administration, regional health authorities and referring physicians.

Recommendation 5: Cardiac Surgery

- A search for a fourth cardiac surgeon should begin so that at least current caseloads can be maintained when Dr. Parrott retires. Although the current compliment of 3 cardiovascular surgeons will likely be able to cope with the modest increases in case load over the short- to mid-term, it is anticipated that an expansion in surgical staff is likely to be required in the longer term.

Recommendation 6: Triage

It is recommended that:

- The VITAL system be viewed as a provincial triage system and patients from all regions be entered into the system.

- Inpatients as well as outpatients be included in VITAL to give a full picture of the needs of cardiac patients in the province.

- The criteria and process for placement in the triage system be well communicated to the regions of the province

- Two nursing positions be identified as triage positions. These individuals would manage the system, liaise with referring physicians and expedite communication between NBHC and its referring physicians and hospitals.

- A consistent approach to data entry and collection be agreed upon and followed. While this should be a local decision, the review team recommends a more centralized model managed through triage at the NBHC.

- Regular reports of waiting times by physician and hospital be provided to improve communication and transparency.

- Outcome data regarding events on the waiting list be added to the current data collection process.

Recommendation 7: New Brunswick Heart Center Services– Administration

- Create a formal program management structure for the NBHC program.

- Identify a medical and administrative leader dedicated specifically to the program.

- Develop a budget envelope for the program which includes funding and expected levels of service.

- Review and ensure adequate financial and clinical reporting systems to support the program.

- Create a program team located at NBHC to support the ongoing management of the program and ensure a comprehensive view of the program.

- Establish a provincial advisory committee with representation from all regions to review strategic issues and progress (ie: volumes, services, etc.).

Recommendation 8: Future Requirements – Procedure Volumes in Cardiology and Implications for Resources and Infrastructure

- The New Brunswick Department of Health and Wellness, in concert with cardiologists and other experts, need to develop mutually agreed upon future minimum targets for rates of invasive cardiovascular procedures. Based on historical trends and procedure rates in New Brunswick and comparison of procedures rates in other jurisdictions across the country the review committee suggests a minimum cath rate in 2005/06 of 630 per 100,000 adult population. The recommendation is 230 PCI procedures per 100,000 adult population and 120 CABG procedures per 100,000 adult population.

- Current catheterization facilities are inadequate to cope with existing demand and the need for at least 50% of another facility that could be shared with an electrophysiology program is

strongly recommended. Current wait lists should be minimized by extending catheterization laboratory hours of operation.

- Ongoing improvements to the transportation of patients between the regions and NBHC should be a priority. Consideration should be given to ensuring the ambulance service has paramedics trained at a level that would reduce the burden of transfer with Registered Nurse accompaniment required.

- The transport system should have ongoing data collection and an evaluation process in place to ensure the clear understanding of costs and benefits associated with the transfer of cardiac patients to the NBHC.

- It is recommended that existing cardiac catheterization facilities should be expanded at the New Brunswick Center as apposed to creating a new program elsewhere. Implementation of such an expansion must ensure that services are provided in the patient's language of choice.

Recommendation 9: Electrophysiology Services

- The review committee recommends that the province of New Brunswick should provide its own cardiac electrophysiology service.

- A third multifunctional laboratory could be used 50% of the time to provide electrophysiologic services.

- The search for an electrophysiologist to direct an electrophysiology program should begin in the near term and consideration should be given to hiring a second electrophysiologist soon thereafter.

- The New Brunswick Department of Health and Wellness, working in concert with cardiovascular specialists and other experts, should develop minimum targets for electrophysiologic procedures and electrophysiologic implantable devices over the near and medium term. It is recommended that in the first full year this new program should perform 225 electrophysiologic studies, 120 ablations and implant 60 automatic implantable cardiac defibrillators. A cost analysis should be undertaken in expectation of this target volume.

- Budget impact planning needs to be started promptly to assess the imminent costs associated with rapidly expanding electrophysiological technologies.

II. BACKGROUND TO THE REVIEW

Purpose and Scope of the Review

The consultants are asked to review the overall delivery of cardiac services in New Brunswick and recommend to the cardiology program review committee (Appendix A) a model of service delivery which will ensure timely access to quality care to both linguistic communities. This review is undertaken at the request of the Deputy Minister of Health to assess the processes and services provided by the New Brunswick Heart Centre (NBHC) provincially and the resources required.

Objectives

- The consultants will review existing clinical, technical, administrative and financial resources and processes currently in existence to support the program.
- Review best practices in general cardiology care, interventional cardiology and cardiac surgery.
- Forecast future needs for these services. The more specific scope of work that will be undertaken by the team includes the following:

  a) Review per capita cardiac surgery rates in New Brunswick and recommend appropriate service volumes.
  b) Review the availability of critical care beds and personnel to support the cardiac surgery program in New Brunswick and recommend appropriate levels of critical care.
  c) Review cardiac surgery outcomes including mortality rates in comparison with other jurisdictions.
  d) Review volumes and wait times for angioplasty services in New Brunswick and recommend appropriate service volumes for the future.
  e) Review angioplasty outcomes in New Brunswick.
  f) Review how patients are placed on wait lists in New Brunswick for cardiac catheterization, angioplasty and surgery and how they are monitored and prioritized and recommend appropriate wait list management protocols and wait times.
  g) Review why patients waiting for surgery in New Brunswick are canceled and recommend actions to reduce frequency of cancellations.
  h) Review the availability of beds to support the cardiac catheterization, angioplasty and general cardiology program and recommend appropriate levels of care.
  i) Review quality management processes for cardiac care and recommend possible improvements.
  j) Review how the present model of care follows guidelines to be provincial in nature and how the program identifies desirable linkages and referral patterns within and amongst all regional health authorities.
  k) Review how the program serves both linguistic communities.
  l) Review clinical and financial sustainability.
  m) Review the need for electrophysiologic services at the New Brunswick Heart Centre including pacemaker insertion, automatic implantable cardiac defibrillator insertion and other electrophysiologic services.
  n) Review cardiology services in the hospital, manpower requirements and availability, waiting times for non invasive diagnostic facilities

Approach

The approach taken in the review involved completion of the following key tasks.

- Initial Project Steering Committee Meeting: The New Brunswick Cardiology Program Review Committee was established. Its purpose was to review cardiac care in New Brunswick and to recommend to the Department of Health and Wellness a model of service delivery which would ensure timely access to quality care to both linguistic communities. The terms of reference for this cardiology program review committee are included in appendices. Part of the mandate of this committee was to use external consultants to assist in completing the report.

- Assemble Consultant Team: A Review Team, comprising four representatives with expertise in cardiac care, cardiac care nursing and clinical administration was assembled.

- Documentation Review: Members of the Review Team received relevant data, reports and documentation in preparation for the site visit (Appendix B).

- Initial Site Visit: The initial site visit took place on January 15th 2004. Initial meetings and interviews were held between the external reviewers and the New Brunswick Cardiology Program Review Committee. The majority of key players at the NBHC were interviewed and further data presented. Several focus groups were conducted with regional health authorities by teleconferencing to provide broad input into the review process (Appendix C). More than fifty physicians, administrators, nurses and other health professional staff participated in interviews.

- Phone Interviews: The review team members used phone interviews for necessary follow-up and to collect any additional data that was required.

- Review of Specific Submissions: A region 1 cardiac catheterization lab proposal was received and reviewed by the external reviewers.

- Second Visit: Site visits were made by Dr. L. Higginson and Heather Sherrard to Moncton to review a catheterization laboratory proposal and to meet with physicians, administrators and nurses at both the Moncton Hospital and the Dr. G. L. Dumont Hospital. Dr. Higginson and Ms. Sherrard also visited with clinicians at the Dr. Everett Chalmers Hospital in Fredericton.

- Preliminary Draft Report: Review Team members documented their findings for their assigned areas of responsibility and submitted these to the Chair for review. These reviews were consolidated and put together into a preliminary draft for review by the entire review team.

- Team Review Preliminary Draft Report: The preliminary draft report was reviewed by the external consultants and modifications required as a result of this review were incorporated.

- Steering Committee Reviews the Draft Report: The report was translated and circulated to the larger steering committee to review the findings and recommendations with a subsequent meeting held in Fredericton for presentation and discussion of the report.

- Final Report: The final report is presented to the Minister.

III. BURDEN OF CARDIOVASCULAR DISEASES AND CURRENT PATTERN OF USE OF CARDIAC PROCEDURES IN NEW BRUNSWICK

Burden of Disease

New Brunswick is a Maritime province with a modest geographical area and a relatively small population of approximately three quarters of a million people. This population has a disproportionately high burden of risk factors for cardiac disease, with rates of smoking, hypertension, diabetes, obesity and physical inactivity all above national averages (Table 1). Also above the national average is the proportion of the New Brunswick population that is socioeconomically challenged [1]. Partly as a result of its high cardiac risk profile, the New Brunswick population experiences higher than average rates of death and health service use, especially hospitalization, than are seen in other parts of Canada [2-4].

Table 1. Cardiac Risk Factor Prevalence (1995-97 to 2000-2001)

	Canadian Average	NB Average	Health Regions						
			HR1	HR2	HR3	HR4	HR5	HR6	HR7
Smoking	26.0	26.4	27.6	23.4	27.0	27.2	33.7*	23.9	29.0
Hypertension	13.0	14.5*	15.5*	15.5*	11.5	13.8	18.8*	13.4	17.4*
Diabetes	4.2	5.1*	5.0	4.5	5.5	5.3	6.5	4.5	6.1
Obesity	14.9	20.2*	21.9*	19.6*	20.7*	18.0	20.2	16.6	23.8*
Physical Inactivity	53.5	61.1*	61.6*	62.1*	62.4*	60.2*	55.4	58.1*	61.6*

*P<0.05 for the difference between regional and Canadian Average, 2000-2001

Data obtained from the Canadian Cardiovascular Outcomes Research team (CCORT) indicate that the burden of cardiovascular disease in New Brunswick is higher than the Canadian average (Table 2). For example, cardiovascular mortality between 1997 and 2000 was 257.7 per 100,000 population in New Brunswick compared with 245.8 per 100,000 population across Canada. Furthermore, hospitalizations for acute myocardial infarction (AMI), congestive heart failure (CHF) and angina were much higher in New Brunswick than the Canadian average. Within New Brunswick, several health regions had hospitalizations rates for AMI that were amongst the highest in the country, particularly in regions HR 7 and HR 3 which were at the 8th and 11th rank respectively. Similarly, for CHF-related hospitalizations, HR 5 and HR 7 came in at the 10th and 12th rank respectively and for angina, HR 3 and HR 7 came in at the14th and 5th rank respectively.

Table 2. Age and Sex Adjusted Cardiovascular Disease Indicators (rates per 100 000 population)

			Health Regions						
	Canadian Average	NB Average	HR1	HR2	HR3	HR4	HR5	HR6	HR7
Cardiovascular Mortality	245.8	257.7 (a)	236	275.5	279	270.5	245.9	218.1	269.4
Ischemic Heart Disease	136.4	129.6 (a)	102.7	152.3	141.8	124.9	128.8	101.7	161.4
Cardiovascular Hospitalisation									
AMI	250.4	292.7	251.5	265.9	341.9	295.4	328.6	295.6	366.6
(rank)**			**-86**	**-71**	**-11**	**-45**	**-21**	**-43**	**-8**
CHF	255.9	322.6	254.9	303.7	358.2	264	504.6	344.1	455
(rank)**			**-90**	**-53**	**-29**	**-85**	**-10**	**-35**	**-12**
Angina	302.1	428.8	425.6	235	577.6	459.7	472.3	375.8	697.9
(rank)**			**-34**	**-109**	**-14**	**-25**	**-22**	**-48**	**-5**
Chest pain	176.1	369.6	441.9	367.4	394.3	301.8	389.4	188.6	410.1
(rank)**			**-6**	**-16**	**-12**	**-31**	**-13**	**-90**	**-10**

*Ischemic Heart Disease and Cardiovascular Mortality (1995-97 only) **Rank means Canadian Rank (1st means the highest rate in a country) Number of Rank: AMI(130 regions), and CHF, Angina ,and Chest Pain(136 regions)
(a) Age standardized only for Cardiovascular Mortality and Ischemic Heart Disease.
Cardiovascular Hospitalization (AMI, CHF, Angina and Chest pain) is presented by Age-and-sex standardized.

In contrast, among patients admitted with AMI, the in-hospital mortality rate was slightly below the Canadian average in New Brunswick, except in HR 4, where the in-hospital mortality was 22% higher than the Canadian average (Table 3). However, readmissions for a complication within the first year after AMI were higher in most regions of NB than the Canadian average. For recurrent AMI, rates were highest in HR 5 and lowest in HR 1. For angina, HR 7 had the highest rate and HR 2 the lowest, and finally, for CHF, HR 5 had the highest rate and HR 6 the lowest.

Table 3. Age and Sex Adjusted Outcomes in Patients with Acute Myocardial Infarction (rates per 100 AMI Patients) (1997-98 and 1999-2000)

			Health Regions						
	Canadian Average	NB Average	HR1	HR2	HR3	HR4	HR5	HR6	HR7
In-Hospital Mortality	12.3	11.7	10.9	11.9	10.8	15	11.3	12.4	13
(rate ratio)*			(0.89)	(0.97)	(0.88)	(1.22)	(0.92)	(1.01)	(1.06)
One-year Readmission for									
AMI	7.7	8.1 (a)	6.9	8.1	7.5	8.2	11.6	9.5	9.1
(rate ratio)			(0.90)	(1.05)	(0.97)	(1.09)	(1.51)	(1.23)	(1.18)
Angina	12.5	14 (a) (b)	12.8	10.5	16.8	13.8	12.3	12.1	22.6
(rate ratio)			(1.02)	(0.84)	(1.34)	(1.10)	(0.98)	(0.97)	(1.81)
CHF	7.5	8.3 (a) (b)	7.9	9.1	8.4	7.8	12.1	5.8	8.5
(rate ratio)			(1.05)	(1.21)	(1.12)	(1.04)	(1.61)	(0.77)	(1.13)

Use of Cardiac Procedures After Acute Myocardial Infarction

Compared to other provinces of Canada, a recent CCORT publication reveals that New Brunswick is situated in the middle of the road in terms of the proportion of patients who undergo cardiac procedures after AMI (Table 4). Across Canada, PCI rates range from 7.2% in PEI to 50.3% in Alberta and they were 35.3% in New Brunswick. Likewise, rates of bypass surgery ranged from 4.7% in PEI to 22.7% in Nova Scotia and they were 13.7% in New Brunswick.

Table 4. Use of Cardiac Procedures Post AMI Across Canadian Provinces (1997/98 to 1999/2000)

		Provinces								
Procedures at 1 year	**CAN**	**PEI**	**NS**	**NB**	**QC**	**ON**	**MA**	**SA**	**AL**	**BC**
PCI	29.58	7.2	29.2	35.3	42.5	23.7	23.5	39.9	50.3	44.2
CABG	15.58	4.7	22.7	13.7	18.1	20.6	20.3	17.7	20.4	17.6
Any Revascularization	45.92	11.5	50.6	48.4	58.7	53.6	42.5	65	68.9	60

Data provided by the New Brunswick Department of Health and Wellness demonstrate variation in the proportion of patients receiving a cardiac procedure after AMI across the health regions of New Brunswick. In fiscal year 2001/2002, the proportion of patients who underwent catheterization within one year after AMI in the province was 53% (Table 5). The data are slightly different from the previous table because they come from different sources and represent different years. This proportion ranged from 63.4% in HR2 to 40.1% in HR4. Similarly, the proportion of patients who underwent PCI varied across NB and ranged from 39.4% in HR2 to 13.1% in HR6. Finally, the proportion of patients who had bypass surgery was lowest in HR5 (4.6%) and highest in HR6 (14%).

Table 5. Use of Cardiac Procedures post Acute Myocardial Infarction in New Brunswick (2001/02)*

		Health Regions						
	NB	**HR1**	**HR2**	**HR3**	**HR4**	**HR5**	**HR6**	**HR7**
Overall CATH %	52.9	54.5	63.4	48.0	40.1	45.8	43.0	57.6
PCI	27.6	27.8	39.4	22.7	15.7	28.4	13.1	29.4
CABG	12.8	9.0	5.8	8.6	7.9	4.6	14.0	8.0
CATH alone	16	16.5	16.1	16.0	15.7	11.9	13.6	20.2

*Fiscal 2001/02 discharges were extracted plus the previous fiscal year of 2000/01 and the next fiscal year of 2002/03. Patients who had discharges only in fiscal 2000/01 or 2002/03 were removed from the data.

Thus, although New Brunswick ranks among the provinces with the highest cardiovascular disease burden across the country, the use of cardiac procedures ranks in the middle compared to other Canadian provinces.

Recommendation

- That under the leadership of the NBHC a surveillance system should be established in New Brunswick to monitor the prevalence of cardiac risk factors and cardiac related morbidity and mortality. This is perhaps best organized through the provincial epidemiology services. Furthermore a task force should be identified to plan strategies to decrease the high prevalence of cardiac risk factors in New Brunswick.

IV. KEY FINDINGS

1. New Brunswick Cardiology Services – Provincial Perspective

Resources

New Brunswick's population of approximately 750,000 is served by eight regional health authorities (RHA), 32 hospitals and community health centers. Each RHA is responsible to administer and deliver insured health services to their defined geographic area.

The Department of Health and Wellness (DHW) defines the strategic direction for health services and the clinical programs to be delivered in the province. DHW has designated certain services as tertiary (or centralized) where most of the weighted cases occur in a limited number of hospitals in the province.

At least ten hospitals across the eight RHAs have intensive care units and acute care beds with telemetry. Medicare data indicates that echocardiograms, pacemaker insertions, and cardioversions are done in all regional hospitals. Stress tests, lab analysis and diagnostic imaging for cardiology purposes take place in many sites across the province.

The cardiology program delivered in New Brunswick is comprised of cardiac cases with both interventional and non-interventional cardiology services (e.g. AMI with and without catheterization or PCI). The non-interventional cardiology portion of the program is covered primarily by cardiologists located in four RHAs, but also includes a large contribution by internal medicine and family practitioners located in all New Brunswick RHAs. The interventional component of the cardiology program and the cardiac surgery program are considered to be tertiary. Tertiary cardiology was established at the NB Heart Center at the Saint John Regional Hospital in 1990-1991.

Tertiary Cardiology Services

During the years from 1994/95 to 1999/00, the DHW identified specific annual funding for all provincial tertiary hospital services in the Regional Hospital Corporations' Budget Assessment Letter. As of 2000/01, following the conversion to RHAs, and at the request of the RHAs, tertiary program-dedicated funding ceased to be specifically identified in the Budget Assessment Letters. This funding policy shift is consistent with the practice in other provinces that have implemented a regional health authority structure, and is consistent with the greater autonomy accorded the creation of regional health authorities. However, one disadvantage of not differentiating the funding of a growing high cost tertiary service from the global budget of a health authority is that it may be difficult to identify specifically the funding required vs. funding provided (AHSC NB Heart Center Services, Workload, Costs and Funding Report, 2004).

Over the past 12 to 18 months, it has become apparent that cardiology resources supporting the tertiary service at the NB Heart Center have been under increasing pressure. In order to better understand the financial issues related to provision of the tertiary cardiology service, RHA 2 recently completed the AHSC NB Heart Center Services, Workload, Costs, and Funding Report in March 2004. That report

complements the findings of this report which looks provincially at the cardiology and cardiac surgery programs from a clinical perspective.

VITAL (Virtual Interactive Telehealth Assistance Link)

A unique feature of the NB cardiology program is the VITAL telehealth component which is based at the Heart Center and provides the following:

- Case management of triage and referral information on patients prior to transfer to the Heart Center, with 24/7 access for health care providers at a distance.
- A hospital to home patient monitoring system for post operative CABG patients via interactive audio and video, with real-time ECG, BP, SPO_2, and wound management for 7-10 days post discharge,
- Remote post-operative six-week check-up in the patient's regional hospital with real-time interactive audio/video, heart and lung sounds, wound management, x-rays
- Pre-cardiac catheterization assessment

VITAL is a method of capable of triaging all referrals for patients from all regions who require cardiac catheterization, PCI, and/or surgery. It enables physicians around the province to enter clinical information on their inpatients and to update this information on a daily basis in order to bring them in to Heart Center.

Service in Official Language of Choice

Provincial legislation stipulates that all government services will be provided in the official language of the client's choice. The NB Heart Center currently has a significant proportion of staff that is bilingual and patient teaching materials are provided in both official languages. In fact, it is evident from the review and from other regions' feedback that the Heart Center has worked hard to recruit bilingual staff and management and to provide training to increase their staff's bilingual capacity. Interviews with physicians and staff in most francophone regions indicated that the service at the NB Heart Center is reported by the patients they refer there to be very satisfactory.

Recommendation

- ➢ It is recommended that the NBHC continue to enhance efforts to recruit bilingual health care providers. Any new services should be implemented in such a way as to ensure that they are provided in the official language of patient's choice.

Electrodiagnostics and Diagnostic Imaging

Electrodiagnostics and diagnostic imaging are available at many places within the province of New Brunswick. These resources are not concentrated at any one center (Appendix D). Wait times for such procedures vary by RHA and facility. At the NBHC there are three echocardiogram machines with a fourth machine on order. There are 3.5 FTE echocardiography technologists to run the existing complement of machines. With respect to diagnostic imaging, four radiologists provide consultations to the cardiac catheterization laboratory. There is limited cardiac MRI and plans are to introduce cardiac CT which will be a provincial resource. Cardiac CT at this time is developing and should be concentrated for the enhancement of expertise at one center. Cardiac perfusion studies are routinely available at the NBHC as well as other locations in the province.

It is important that provincial standards are established with respect to what are considered acceptable waits for these non-invasive procedures and, once developed, these standards should be adhered to. As a guiding principle, the wait list should not exceed one month through put. Current wait times are six months at the NBHC for a routine echocardiogram, four months for stress echocardiography and three weeks for a Holter monitor. The echocardiography wait times at the NBHC are in particular, overly long. It should also be remembered that the establishment of an electrophysiology service will have an impact on electrodiagnostic support personnel.

The steps required to implement a wait list management system for electrodiagnostics and diagnostic imaging would include the following:

- Development of standardized criteria/methods to determine appropriateness of services for patients.
- Implementation of supporting information systems.
- Clear definitions and processes to be observed by all regarding wait list reporting.
- Ongoing systemic monitoring and dynamic information exchange across management, referral and provider sites.

Recommendation

- Although electrodiagnostics and diagnostic imaging are available at many places within the province wait lists for certain non-invasive diagnostic procedures, particularly echocardiography, are unacceptably long in some of the health regions. Provincial standards need to be established with respect to what are considered acceptable waits and, once developed, these should be adhered to.

- In order to both impact the existing patient wait list and deal with increasing demand, additional echocardiography machines and technologists to run them appear to be required.

Cardiovascular Health and Wellness Program

As discussed in an earlier section of this report, the New Brunswick population carries a disproportionate burden of cardiac disease risk factors, at least by comparison to other parts of Canada. Although many of the areas covered thus far in this report are clearly important, they deal with the management of the more acute aspects of cardiovascular disease. Cardiovascular illness is rarely cured and even coronary revascularization represents merely a temporizing measure. Therefore, equally as vital as stabilizing an acutely ill cardiac patient or performing their bypass procedure is the need to address the cardiac risk factors that both caused their disease and perpetuate it.

The Cardiovascular Health and Wellness Program at the NBHC is open to cardiac patients and individuals at risk for having cardiac disease. The review team was informed that space is inadequate for the expanding program. Space for this program is needed to provide supervised exercise and an expanding educational program. This program treats and educates about weight reduction, managing diabetes, exercise, controlling blood pressure and smoking cessation. Excellent data produced by the program has shown the benefits associated with decreased admission rates and superior return to work

rates. The review team is strongly supportive of this program. Expanded space is essential and the program needs to develop greater outreach to other regional health authorities. Other regional health authorities demonstrated a desire to become more closely affiliated with this excellent program such that there could be more sharing of protocols and spread of expertise into the other regional health authorities. Expertise and willingness to collaborate certainly appeared possible with more structure and infrastructure support.

Recommendation

- The cardiovascular health and wellness program at the NBHC is a provincial resource and needs to be adequately supported in terms of space and funding needs. This program should provide leadership in terms of establishing a province wide prevention strategy and improving province wide cardiac rehabilitation. There needs to be sufficient resources to each of the regions to provide service in cardiovascular health and wellness.

2. NEW BRUNSWICK HEART CENTER SERVICES

Resources – Physician Profiles and Bed Allocation

The NBHC was established in 1991. Until the opening of this unit patients requiring specialized cardiac services traveled out of province for treatment and 80% of New Brunswick patients received their care in Halifax while the other 20% went to either Quebec or Ontario. Original public support for the program hinged around the establishment of a cardiac surgical program in concert with interventional cardiology. The NBHC Program Management Structure has a clinical department head in cardiac surgery and a divisional head in interventional cardiology reporting to the Chief of Staff at the Atlantic Health Sciences Corporation.

Since 1991, the NBHC has provided a comprehensive multidisciplinary cardiology and cardiac surgery service to the people of New Brunswick. From the interviews and from the data reviewed, the review team was impressed with the excellent cardiology care that is provided at the institution. Accolades for the program were provided by all of the physicians interviewed throughout the province. There are, at the time of review, four general cardiologists, Drs. Marr, Bewick, Bessoudo and Douglas, practicing at the NBHC. These cardiologists are responsible for looking after a great number of the transfers to the NBHC as well as looking after patients admitted to the Emergency Room. They are responsible for the non-invasive testing including echocardiography, stress testing, nuclear imaging and overseeing the cardiovascular health and wellness program. The volume of work for these individuals is a major concern for this review team.

There are in addition four interventional cardiologists (Drs. Paddock, Lutchmedial, Teskey and Corbett). There are two catheterization laboratories presently in operation with equipment replaced in 2003. The hours of operation of the two laboratories are from 07h00 to 15h30, Monday to Friday and the facilities are on call after hours.

Perhaps the best comparator in eastern Canada for the NBHC is the Queen Elizabeth II Health Sciences Center (QEII HSC) in Halifax. It is a valuable exercise to compare how these two institutions allocate beds and resources.

The NBHC has two inpatient cardiology services (units 3B South and 5A North). On 3B South, cardiac services consist of 31 beds, including five step down beds, 11 cardiac surgical beds, 9 interventional beds and 6 outpatient beds available for cardiac catheterization. Ward 5A North has 30 beds: twelve for general cardiology, six hospital-to-hospital transfer beds, which are protected and 12 coronary care unit beds.

The NBHC follows a substantially different bed allocation model than does the QEII Health Sciences Centre, with a similar sized CCU but a much smaller stepdown unit and a substantially smaller ward (see table below). The transfer service is 50% larger at the NBHC than at the QEII HSC while the number of beds allocated for outpatient catheterization is more than twice as large at the QEII HSC. Beds are dedicated to interventional cardiology at the NBHC but not at the QEII HSC. Finally, all cardiology and cardiovascular surgery bed resources are geographically and administratively separate in Halifax while cardiac surgery ward beds are located together with cardiology beds on 3B south in Saint John.

This is not to suggest that one institution is more appropriately configured than the other but rather to provide the basis for comparison. If anything, when compared to the QEII HSC, the NBHC bed configuration would seem to be more oriented towards its provincial as opposed to its community health care mandate. Furthermore, bed allocation appears to reflect a bias towards critical care and to a percutaneous as opposed to a surgical approach to coronary revascularization.

Table 6

Designation	**Nova Scotia QE II**	**New Brunswick NBHC**
	# Beds	**#Beds**
CCU	10	12
• Chest pain evaluation unit	2	-
IMCU/stepdown	14	5
• Transfer service	4	6
Ward	36	12
Day Patient Unit	14*	6
Interventional	-	9
Cardiovascular ICU	12	?
Cardiac Surgery Ward	31†	11

*Up to 5 of these beds are available for post-PCI care
†Includes 12 stepdown beds

For the overall operation of the program it is extremely important that these services are totally functional and that manpower is sufficient to look after transfers that come into and out of the NBHC. This appears to be a weak link in the chain and maximal utilization of services is not possible at times because of bed availability and/or insufficient physicians on hand to look after transfers in and out of the unit. This must be remedied. Part of the problem has had to do with remuneration of physicians working on the inpatient services. The review team identified this as a major problem and one that needs to be resolved. Indeed, a large part of cardiac services deals with the investigation and

management of cardiac patients exclusive of revascularization therapy by either percutaneous intervention or bypass surgery.

From multiple conversations, it would appear that improved relationships are required between the NBHC and the non-invasive cardiologists who are pivotal in the smooth running of this program. Recently, this became apparent when coverage was not appropriately available for patients transferred to the NBHC from outlying regional health authorities. This problem exposed the vulnerability of the overall program to withdrawal of services by any of the cardiovascular health care professionals. A number of remedial possibilities were explored but further negotiation between the stakeholders, including the physicians, the DHW and the Medical Society needs to take place.

The cardiology group within the NBHC has an unusual composition, with equal numbers of interventional and non-interventional cardiologists. The review committee is unaware of any other cardiology group in Canada that is similarly constituted. The QEII HSC in Halifax is the largest regional hospital in Nova Scotia with full tertiary care cardiovascular services including invasive and revascularization facilities, and hence is the peer-group benchmark for the Saint John Regional Hospital and the NBHC with a similar mandate in terms of providing province-wide tertiary care. In 2002/03, the QEII Division of Cardiology included 26 cardiologists providing 19.65 full time equivalents of non-research service. The group currently comprises 28 physicians of whom 8 are interventional and 20 are non-interventional cardiologists.

In New Brunswick, there are 17 cardiologists: eight in Saint John (including the four interventional cardiologists at NBHC), eight located in two RHAs in Moncton, one in Bathurst, and many specialists in internal medicine who assist in the diagnosis and management of cardiology patients pre and post tertiary intervention.

Workload

The cardiologists at the NBHC appear to be shouldering a very large workload, one that is especially impressive when put in perspective by comparison to a neighboring, peer group institution. In 2002/03, there were 5 interventional cardiologists, providing 4.25 FTE of non-research service, performing procedures at the QEII HSC versus 4 interventionalists, assumed to be devoting 95% or more of non-research service, working at the NBHC. From these figures one can calculate rates of angioplasty per full time equivalent interventional cardiologist of 253:1 in Halifax and 298:1 in Saint John.

Using a similar analytic approach, it is the non-interventional cardiology group at the NBHC who appear, in particular, to be markedly overworked. Thus there were 10.37 non-research FTE cardiologists performing routine stress tests and 7.26 non-research FTE cardiologists reading echocardiograms in Halifax in 2002/03 versus 4 non-interventionalist cardiologists in Saint John, assumed to be providing at least 95% of their time to non-research activities, who supplied these same services. Thus, the ratio of routine stress tests to FTE non-interventional cardiologists was 1:697.6 in Halifax versus 1:933 in Saint John. The respective ratios for routine transthoracic echocardiograms were 1:617 versus a staggering 1:2,604.

Not surprisingly, in view of the disparity in workload, there is a sense of disenfranchisement leading one of the non-interventional cardiologists in Saint John to suggest that there have been "extensive contributions over these last eleven to twelve years of the clinical cardiology group to the running of the tertiary program for which there has been absolutely no substantive or symbolic recognition". This group of clinical cardiologists is extremely important to the smooth running of the program. All efforts must be taken to support them and to make them feel an integral part of the NBHC. This may come in

the form of nurse associates, hospitalists, financial incentives, increased technician time in the electrodiagnostics laboratory and in the purchase of extra equipment if necessary. Critically important services such as stress echo and transeosophegeal echocardiography must be supported. Although the review committee understands that there have been significant improvements recently, at points last year there was an excessive six-month wait for an echocardiogram, and an eight-week wait for a stress echo. This is unacceptable and underscores the importance of infrastructure support. There is a shortage of physician manpower at the NBHC and the program must realize that recruitment of non-invasive cardiologists is as important to the overall program as the recruitment of a new interventional cardiologist or an electrophysiologist.

Traditionally Nurse Practitioner roles are used to augment physician practices. The NBHC has a nurse Associate role which some what resembles the NP scope of practice without the formal training and licensing arrangements of some provinces. Currently these individuals have a large scope of practice and many feel they are essential to the ongoing operation of the NBHC program. There are some issues that result with the use of these positions including: ensuring there is a careful delegation of medical acts, appropriate in house training (since these are specialized positions in acute care), recruitment and retention, ensuring physicians remain active in the role of patient care and ensuring the skills of these individuals are used appropriately. The creation of additional positions could be undertaken in the short term to support the physicians until their manpower issues are stabilized. Careful consideration will have to be given to ensuring appropriate tasks are delegated and the skills of these individuals are maximized.

Recommendation

- Physician workload at the NBHC appears excessive and a manpower review seems overdue; indeed, it is the opinion of the review panel that it is as important to consider the number of non-invasive cardiologists as it is interventionalists or electrophysiologists in future planning around the program.

- Until and unless the numbers of noninvasive cardiologists can be increased, consideration should be given to lessening the workload through the use of physician extenders/assistants.

- Pre- and post-procedural care by the non-invasive cardiologists of patients referred for a percutaneous procedure has been a particular area of concern given that this work is time-consuming, poorly remunerated, and distracts from other clinical and financial opportunities. This needs urgently to be addressed through changes in the fee code associated with this service or appropriate stipends.

Cardiac Catheterization and Intervention Procedures

Since the opening of the NBHC there have been dramatic changes in the treatment of coronary artery disease. The greatest change in the last several years has been the incremental increase in percutaneous coronary intervention (PCI). With this procedure, interventional cardiologists using the specialized facilities at the NBHC are able to visualize coronary arteries. This process is called cardiac catheterization. Using cardiac catheterization they are able to identify constricted areas, dilate identified areas of arterial narrowing with a balloon and place stents to prevent renarrowing. Clinical studies have stressed the importance of early referral of patients with impending heart attack (acute coronary syndrome) for early cardiac catheterization and revascularization either by PCI or bypass surgery. This approach has markedly changed revascularization strategies at the NBHC and all across our country. Thus, while surgical volumes have remained relatively stable, revascularization by

angioplasty has increased exponentially. The more aggressive interventional approach to acute coronary syndromes including unstable angina and acute myocardial infarction has dramatically increased revascularization volumes and new improved drug eluting stents will further shift the balance to revascularization by angioplasty rather than by open heart surgery. These new stents markedly decrease restenosis and have been proven cost efficient although acquisition costs are high. At the present time, there is no clear budget for drug eluting stents in the interventional program at the NBHC. Finally, although at the present time there is no electrophysiologic laboratory at the NBHC this is such an important facet of cardiology that development in this area is essential.

Patients come to the NBHC from several routes and most are referred for some form of invasive diagnostic or interventional procedure. Patients received through the Emergency Department are admitted to the coronary care unit and frequently await urgent cardiac catheterization. Regional Health authorities send referrals to a cardiologist at the NBHC or may refer directly to one of the interventional cardiologists. There is a triage system for urgent inhospital patients known as the VITAL system. Through this system urgent inhospital patients are triaged depending on symptoms and objective measurements of risk.

There are between 40 and 50 patients each day waiting to be transferred to the NBHC from the various health regions of New Brunswick. Urgent patients are prioritized through the cardiac triage program, with the most urgent transferred when a bed is available on 3BS or 5AN. For the year 2002/2003, an average of 117 patients per month were transferred to Saint John for urgent therapy.

All of the Regional Health Authorities were very concerned about the length of time patients had to wait for referral into the NBHC. Indeed, owing to the size of the wait list, providers in some health regions are referring patients out of the province. In 2002/03, 161 patients received cardiac catheterization outside of New Brunswick, 83 in Nova Scotia and 78 in Quebec. Most of the patients catheterized in Quebec came from Regional Health Authority 4 or 6. Figures for out of province catheterization were comparable for 2003/04. As regards angioplasty in 2003/04, 26 patients received the procedure outside the province. When speaking with the Regional Health Authorities, these transfers out of the province occurred not because of the quality of work at the NBHC but because of availability of services.

To deal with the demand for invasive cardiac services, the NBHC currently has two cardiac catheterization laboratories where interventional cardiologists perform diagnostic cardiac catheterization and PCI. In the year 2002/03, 2073 patients had diagnostic cardiac catheterization, 1069 had diagnostic catheterization plus percutaneous intervention at the same setting and 76 had interventional procedures alone. In 2003/04, most patients investigated in the cardiac catheterization laboratory will have any required interventional procedure performed at the same time as the diagnostic cardiac catheterization. The performance of the angioplasty at the time of the diagnostic cardiac catheterization is called ad-hoc intervention and this cannot occur unless the cardiologist is trained to do both the diagnostic and the interventional procedure. The NBHC has one of the highest ad-hoc procedure rates in the country with more than 90% of interventional procedures being performed at the same time as the cardiac catheterization. This speaks to excellent utilization of cardiac catheterization facilities.

The review committee understands that there is no formal quality control committee around interventional procedures at the NBHC. Although the results have been excellent it is important to record and review complications which occur within the hospital and on the waiting list for these interventional procedures. This report should be generated quarterly and submitted to administration, DHW and to the various regional health authorities.

Funding will be necessary for emerging technology most importantly at the moment, drug-eluting stents. This is an important new funding requirement of the program.

Recommendation

- The wait times for access to invasive cardiac services are overly long and all efforts must be made to correct this problem. Wait list management must occur not only for patients awaiting interventional procedures in hospital but also for outpatients. An appropriate triage system must include dedicated personnel to appropriately handle triage, to communicate with hospitals and with patients.

- Regular quality reports must be generated from the interventional laboratories regarding complications that occur during hospitalization. These reports should be referred on to administration, regional health authorities and referring physicians.

Cardiac Surgery

The NBHC is the only institution in the Province of New Brunswick that provides cardiovascular surgical services. Two operating room suites have been committed for cardiovascular surgery. These suites are resourced with 2 dedicated echocardiography machines, 2 heart lung machines with a third as back-up, 3 intra-aortic balloon pumps and 2 cell saver devices.

Currently, there are 3 cardiac surgeons on staff, Drs. Parrott, Brown and Forgie. Dr. Parrott, the Chief of Service, is due to retire in the near future and succession planning is underway. The surgeons are supported by 6 perfusionists and 9 FTE cardiovascular nurses. Collectively, this team performed 668 cardiovascular surgical operations in 2002/03.

Using Canada-wide data from 1997/98 to 1999/00 (Table 4, page 12), and if one accepts the proportion of patients revascularized following an acute myocardial infarction as being a representative measure for benchmarking, then the rate of cardiovascular surgery is slightly higher in New Brunswick than it is for the rest of the country. The quality of the surgical team is reflected in the excellence of their outcomes. Using outcomes after coronary artery bypass graft procedures as a convenient measure for benchmarking the quality of surgical care, between 1992/93 to 2000/01, New Brunswick had the lowest in-hospital mortality rates of any province in the country[10].

As in any jurisdiction in Canada, the centralization of cardiovascular surgical services and the resultant constraint in supply means that some patients will have to wait for their surgery. Standard wait times are within 1 month for urgent patients, within 4 months for semi urgent patients and from 4-6 months for elective cases. As of mid-January 2004, there were 93 patients on the cardiac surgery wait list in New Brunswick, with patients assigned to one of three non-emergent triage categories. The cardiovascular surgical service is well managed and the review committee was given to understand that projected increases could be readily accommodated without needing to expand human or health care resources. This is important as projected changes in demographics and disease prevalence would be anticipated to increases need, while the proposed expansion in cardiac catheterization would service would serve as a catalyst in driving up surgical caseload.

Some projections are possible with respect to future cardiovascular surgery caseload in New Brunswick. Using trends in New Brunswick and volumes from other jurisdictions this review committee proposes a minimum target of 110 CABGs per 100,000 over 20 years of age by 05/06.

Applying this minimum target for CABG to New Brunswick with its population of 548,741 persons aged 20 years or older would require that approximately 683 coronary artery bypass graft procedures are performed at the New Brunswick Heart Centre by 2005/06. Assuming another 100 or so cases for valvular and other cardiovascular conditions and given that case load was already at 668 in 2002/2003, it is entirely possible that minimum cardiovascular surgical needs for the province of New Brunswick could be accommodated with existing resources for the near future. However, the departure of Dr. Parrott from the surgical roster could easily upset these assumptions while any increase in surgical load beyond 800 cases per year would seem difficult to manage with only 2 operating suites and 3 cardiac surgeons.

By comparison, Nova Scotia with a population of 944,772 has 7 full time equivalent surgeons. Thus, the ratio of cardiovascular surgeons in New Brunswick is approximately 1 per 250,000 versus about 1 per 135, 714 in Nova Scotia.

Wait times were substantially longer in Nova Scotia than in New Brunswick. As of March 2003, the end of fiscal year 2002/03, there were 177 patients awaiting cardiovascular surgery in Nova Scotia. Wait times were 6.4 weeks for semi-urgent A, 10.5 weeks for semi-urgent B and 23.3 weeks for elective patients. These comparisons attest to the high quality and efficiency of the cardiac surgical program at the NBHC.

Excellent records are kept by the surgical department at the New Brunswick Heart Center regarding complications around surgery, and results of the home monitoring program. These statistics are invaluable and the committee applauds the surgical department for this data collection and publication. This information should also be reported quarterly to DHW and the other RHAs.

Recommendation

- A search for a fourth cardiac surgeon should begin so that at least current caseloads can be maintained when Dr. Parrott retires. Although the current compliment of 3 cardiovascular surgeons will likely be able to cope with the modest increases in case load over the short- to mid-term, it is anticipated that an expansion in surgical staff is likely to be required in the longer term.

Provincial Triage System

A provincial triage system is an essential element in the care of cardiac patients. In essence it allows for the sickest patient to be cared or first. At the NBHC triage is accomplished through the VITAL program. During the course of our review we interviewed staff who worked directly with the VITAL system as well as end users. Five areas of importance were noted in these interviews: Completeness or participation in the system; data integrity; transparency in the triage process; access to providers at NBHC for updates and feedback on waiting lists.

Completeness and Participation in the VITAL System.

Inpatients awaiting procedures or transfer to the NBHC are entered into the VITAL system. These patients are triaged and placed in order for transfer. While patients are awaiting transfer staff can enter the system and update the patients' condition if necessary. Of note patients in the Saint John region and all outpatients are not entered into the system. This in fact creates a partial triage system with the majority of patients (outpatients) outside the system and one of the primary users (Region 2) not participating. As a provincial program NBHC is not able to provide a complete picture of the status of

cardiac care in the province both in terms of access and mean waiting times. Without exception all of the regions we spoke to felt that the Saint John region should be participating as well.

The outpatients represent a large cohort of patients that need to be managed and part of the triage process. A number of physicians have taken to directly referring these patients to centers outside of New Brunswick since they feel they will not receive timely access to care.

There is a sense in some of the communities that Region 2 is better served. Without full participation in the triage system, this cannot be supported or refuted. It does however; leave a number of referring centers with a lack of trust in the system.

Data Integrity

We identified large variations in how well the triage system was being used and updated. Some physicians and referral centers were rigorously entering data and updating conditions. Others felt they could get farther ahead with a phone call – so they spent less time entering triage data. When asked during the interview process, referral centers could not articulate clear expectations around data requirements. We were unable to identify a formal quality control process which ensured the validity of the data in the triage system.

The existing system was designed to be a decentralized one so that the local users would input data, update the data and view where their patient was on the list. In concept this is an important approach, placing some of the accountability at the referring site, where in fact the needed information is generated. If all sites participate equally a decentralized structure is effective. Currently, that structure does not seem to be optimally functioning for a variety of good reasons. The DHW should consider centralizing data acquisition and reestablishing the guidelines for data. Inputting of data should be the responsibility of the triage group in a more centralized system. NBHC needs to take ownership of the data integrity and create a smooth mechanism for updating patient condition which seems to be a major area of concern. Full participation in the system will increase confidence in the triage process and further support the need for valid and reliable data.

Transparency in the Triage Process

There is lack of transparency in the actual triage process or how a patient moves up and down the list. Physicians and staff from referring hospitals could not clearly articulate how the process worked. A number of physicians told us that today their patient might be 10 and tomorrow they might be 15th. Their issue was not so much the placement but how they got there. This problem is aggravated by the fact that a significant number of patients (region 2) never entered the system but were accommodated in the actual procedure rates.

Ongoing Contact with NBHC

Several staff are involved in the triage of patients. When we asked users from the various regions the process to receive information from the triage system on the status of their patients or to discuss a problem we heard a variety of answers. Some were not really clear on whom they should call; others had established a usual contact and some simply stated they started phoning until they reached someone who could help. Others were simply frustrated with the system.

There are a number of staff at NBHC who work directly with the triage system. In addition there are a number of advanced practice nurses who work within the program. The program has reached a stage in terms of volume and maturity where it should consider creating a permanent triage nurse position for each of cardiology and cardiac surgery. These roles act as the human interface between the referral physicians, hospitals and NBHC. With the ongoing pressures on the interventional cardiologists and cardiac surgeons in terms of procedure throughput, these roles provide an important link between referral centers and NBHC. When working to full scope of practice, these individuals are able to respond to many of the questions, can provide information on waiting list status, and are able to directly access cardiologists to respond to problems. These individuals work to ensure that equal access to services, based on need, is achieved. In time they become viewed as an asset to the province and provide a degree of transparency to the triage process. They are an important link in the communication channel, providing referring physicians with one number to call. Given the current procedure projections, one for each service should be sufficient depending on the scope of the position. There are a number of models of this nature, with Ontario having the model which has been formally developed the longest.

Feedback on Waiting Lists

Triage systems which capture waiting time and access should be used to provide feedback to all referral hospitals on the mean waiting times. This has not been the practice of the NBHC , nor is it possible when Region 2 data is not entered. The issues with data entry and integrity also limit the ability to provide information on access to cardiac services.

There is a sense that Region 2 has significantly better access than other regions. This cannot be supported or refuted because the data for that Region is not in the system. Of note, most providers agree that patients in Region 2 would have a somewhat shorter wait simply because they can be pulled in quicker in the event of a cancellation etc. Most physicians accept that differences in wait times in the magnitude of days would be acceptable, but there is a sense that the magnitude is in weeks. The full implementation of the triage system for both inpatients and outpatients including region 2 will allow for transparent reporting of waiting times by physician and region. This would increase the confidence and improve the trust in the system. In addition it is important the NBHC set up a mechanism to capture events while patients are on the waiting list. This is important outcome data that should be monitored while patients wait.

The NBHC already has many of the components of a triage and waiting list management system (see appendix G). Typically these systems include the following elements: Patient referral; Triage and Urgency scoring; Booking; Outcome tracking and Reporting. The following recommendations will enhance the existing system:

Recommendation

It is recommended that:

- The VITAL system be viewed as a provincial triage system and patients from all regions be entered into the system.
- Inpatients as well as outpatients be included in VITAL to give a full picture of the needs of cardiac patients in the province.
- The criteria and process for placement in the triage system be well communicated to the regions of the province
- Two nursing positions be identified as triage positions. These individuals would manage the system, liaise with referring physicians and expedite communication between NBH and its referring physicians and hospitals.
- A consistent approach to data entry and collection be agreed upon and followed. While this should be a local decision, the review team recommends a more centralized model managed through triage at the NBHC.
- Regular reports of waiting times by physician and hospital be provided to improve communication and transparency.
- Outcome data regarding events on the waiting list be added to the current data collection process.

Administrative Structure

Over the past two years the increased pressures on interventional cardiology, the ability to medically staff some of the units, and the continuing shift of patients to other provinces has led to some concerns about the program being able to fully serve the needs of the province. There is a need to realign the program's administrative structure giving it a clear mandate to serve the province, to hold the program accountable both for its services and costs, and to lead the development of cardiac related services for the province.

The current Administrative Director has responsibility for a number of other services, which in fact compete for time and resources. Physicians report up through the usual medical structures of the hospital, however, there is no one physician ultimately accountable for the clinical output of the program. In addition, the medical staff have a perception that the funding to the program has diminished. Given the critical mass of the program, the projected growth of interventional cardiology and the new demands of an electrophysiology service, consideration should be given to a more formal program management structure. Given the regional structure of New Brunswick and the location of the NBHC program within Region 2 some modifications to the existing structure could be made to improve the accountability and operations of the program.

Wherever possible, all elements of the NBHC program should be focused under one administrative Director. This would include everything from triage, to treatment and rehabilitation. This should be his/her sole responsibility. They should also be charged with liaising with the other regions, assisting with cardiac program development and being a resource for the other facilities. A mechanism for creating a program budget needs to be established so that the program is aware of its budget and service requirements A program team, co-led by a Medical Director and the Administrative Director should be developed with representation from the necessary services. This group should be responsible for service output, quality of care, budget and new program development. Having a program focused structure with a clearly specified budget and service levels will assist in an improved understanding of the costs and issues related to the cardiac program.

There is a desire by the regions to have feedback and information on how the cardiac services are being provided. This can be achieved by creating an advisory committee with membership from all the regions. The purpose of the committee would be to review the strategic issues such as volumes, new services, etc., and allow for some input from the various regions. This would also be a good forum to update the regions on progress regarding recommendations which evolve from this report. This advisory committee should not be involved in day to day management which remains the responsibility of the NBHC.

Recommendation

- Create a formal program management structure for the NBHC program.
- Identify a medical and administrative leader dedicated specifically to the program.
- Develop a budget envelope for the program which includes funding and expected levels of service.
- Review and ensure adequate financial and clinical reporting systems to support the program.
- Create a program team located at NBHC to support the ongoing day to day management of the program and ensure a comprehensive view of the program.
- Establish a provincial advisory committee with representation from all regions to review strategic issues and progress (ie: volumes, services, etc.)

3. FUTURE REQUIREMENTS

Procedural Volumes in Cardiology and Resource Implications

It is beyond the scope of this review to specify minimum provincial targets in angioplasty and coronary artery bypass surgery. However in order to assess future facility and personnel requirements it is important to project, if possible, what the growth may be in the next several years. Table 7 from the Canadian Journal of Cardiology, March 15, 2004 page 393 demonstrates cardiac catheterization rates across several provinces from 1997 to 2002. Rates in fiscal year 2001/02 range from 420 to 553 per 100,000 adults. New Brunswick fits near the upper end of this range with procedural rates of 548 per 100,000 adult population.

Table 7

Provincial cardiac catheterization procedure rates per 100,000 population aged 20 years and over

By province, according to treating facility, between 1997 to /2002

	1997/1998	1998/1999	1999/2000	2000/2001	2001/2002
Canada	359.9	381.1	418.4	445.2	471.5
Newfoundland	448.2	445.9	493.9	491.4	521.4
Nova Scotia	486.7	498.4	530.9	509.4	555.2
New Brunswick	N/A	455.9	499.3	490.7	547.9
Quebec	351.2	362.9	385.4	433.7	419.5
Ontario	338.9	384.7	427	466.7	509.6
Manitoba	N/A	433.8	429.7	429.1	520.1
Saskatchewan	356.7	363.1	372.7	379.4	387.9
Alberta	431.8	452	501.2	522.6	553.2
British Columbia	324.8	315.9	375.7	364.7	390.9

Rates of PCI for New Brunswick by comparison to other provinces are shown in Table 8 at the top of the following page. In this instance, New Brunswick fits near the middle with no significant increase in rate between 1998 and 2001. This is the most recent comparative data available from an article published March 15, 2004 in the Canadian Journal of Cardiology.

Table 8

Age-and-sex adjusted percutaneous coronary intervention rates per 100,000 population aged 20 years and over by province of residence, 1997/1998 to 2000/2001

	1997/1998	1998/1999	1999/2000	2000/2001	Overall
Canada	102.7	112.3	122.8	138	119.3
Newfoundland	133.7	162.5	113.1	119	131.9
PEI	88	90.9	100.8	98.8	94.6
Nova Scotia	110	109.9	111.8	129.8	115.6
New Brunswick	106.8	127.3	123.9	129.9	122.1
Quebec	136	142.3	162.2	179.6	155.5
Ontario	69	79.7	87.3	105	85.6
Manitoba	91.2	110.8	112.3	131	111.5
Saskatchewan	109.4	112.8	138.2	154.6	128.9
Alberta	130.9	148.4	156.5	165	150.6
British Columbia	111.8	117	130.9	141.1	125.5

The rates for cardiac catheterization and PCI will change very significantly in the next several years. Assuming that New Brunswick pursues a similar growth rate as other provinces we can estimate the number of cardiac catheterizations, angioplasties and bypass surgeries that will be required in the future. This may be a conservative estimate because a needs base prediction would be higher for New Brunswick realizing the increased burden of disease in the province previously outlined in this report.

In Table 9 actual numbers and recommended numbers using these targets are outlined. This analysis uses an adult population over the age of twenty of 569,000 with little predicted growth over the next ten years.

Table 9 Actual Target and Recommended Target Procedures per 100,000 Adult Population

	2002/03 NB Actual Per 100,000	2005/06 Recommended Per 100,000	2008/09 Recommended Per 100,000	# of Procedures Recommended 2005/06
Cath	544	630	740	3585
PCI	201	230	250	1309
CABG	117	120	125	683

These numbers give us some estimation of what the potential need may be for specialized cardiac services around cath, PCI and CABG in the next few years.

Recommendation

- The New Brunswick Department of Health and Wellness, in concert with cardiologists and other experts, need to agree upon mutually agreed upon future minimum targets for rates of invasive cardiovascular procedures. Based on historical trends and procedure rates in New Brunswick and comparison of procedures rates to other jurisdictions across the country the review committee suggests a minimum cath rate in 2005/06 of 630 per 100,000 adult population. The recommendation is 230 PCI procedures per 100,000 adult population and 120 CABG procedures per 100,000 adult population.

Impact on Infrastructure

Whatever minimum provincial targets are set for invasive diagnostic and coronary revascularization procedures, the increased volumes for cardiac catheterization, PCI and bypass surgery will place significant demands on infrastructure, including lab and surgical suites. It also implies increased demands on community hospital beds and particularly for New Brunswick ambulance transfer systems. Down stream there will be concurrent need for more intensive care unit beds, nursing staff and management systems. At the present time New Brunswick appears to be quite well equipped with intensive care unit beds however this downstream demand needs to be considered. One of the important considerations at the moment is laboratory space and its utilization. At the present time there are two cardiac catheterization laboratories at the NBHC. Each operates eight hours per day; five days per week and each room services on average eight patients per day. There is also a significant demand upon the interventional cardiologist who spends hours before the cardiac catheterization and afterwards to manage these ill patients.

If we assume that a diagnostic cardiac catheterization averages 60 minutes, a regular PCI 100 minutes and an ad hoc PCI 110 minutes we can make an assessment of time required and facilities available. These assumptions come from a survey of 17 laboratories in Ontario (CCN Target Setting Document). In fiscal year 2002-03 at the NBHC 76 patients received PCI alone, 2037 underwent diagnostic cardiac catheterization alone and 1069 had diagnostic coronary angiography together with PCI. The catheterization laboratory time required to perform this level of service, given the above assumptions, would be 4107 hours. At the present, the two catheterization laboratories at the NBHC operate for 8 hours per day. Assuming no down time, and business as usual for 48 weeks per year with ten days of closure for statutory holidays they have performed these procedures in 3680 hours, i.e. have performed extremely efficiently. If the minimum projected targets in 2005/06 of 630 diagnostic coronary angiograms and 230 PCI per 100,000 population over the age of 20 are to be met and if in addition 90% of these PCIs will continue to be performed in ad hoc fashion at the same time as cardiac catheterization then 4885 hours will be required. Assuming an 8-hour day with business as usual for 48 weeks per year with 10-days of closure for statutory holidays and 10 days of closure for downtime, each catheterization laboratory should provide 1920 hours per year. A 10-hour cath lab with one half hour of down time each day and a 48-week operating schedule would provide 2280 hours per year. Using the 8-hour model which is the most cost efficient to staff, 2.5 cardiac catheterization laboratories are required to meet the minimum projections. This leaves the option to move to a 10-hour cath lab if procedure times or down times increase (see calculations Appendix E). Therefore in order to meet these minimum projected demands, 2 ½ cardiac catheterization laboratories dedicated entirely to cardiac catheterization and PCI will be required. Of course this analysis is sensitive to the assumptions used. Any increase in the average duration of procedure or any anticipated slowdowns, for instance due to equipment malfunction, or any increase in demand due to changes in patterns of practice will significantly and adversely affect these assumptions. At the very least it seems clear that achieving any

measurable increase in procedural volumes will not be possible with only two cardiac catheterization laboratories. On the other hand with a stable population projected over the next ten years three laboratories fully utilized ten hours per day may not be required and sharing a facility with electrophysiology may be the preferred option in the foreseeable future especially given the forecast need in implantable devices and specialized arrhythmia management as discussed below.

Although the review did not specifically address the patient transportation system, it is a vital infrastructure component to an effective provincial system. A number of regions mentioned their challenges in transporting patients and the need to ensure the transfer service was cost effective with this model of care. As part of our discussions with stakeholders, the review committee is aware that the DHW is planning to enhance ambulance services. We recommend that ongoing improvements to the transportation of patients between the regions and the NBHC be a priority. Consideration should be given to ensuring the ambulance service has paramedics trained at a level that would reduce the burden of transfer with registered nurse accompaniment required. This would also enhance the services for the province as a whole with services other than cardiac benefiting from the approach.

The transport system should have ongoing data collection and an evaluation process in place to ensure the clear understanding of costs and benefits associated with the transfer of cardiac patients to the NBHC. The evaluation methodology should also consider the larger benefits of improved transport of patients in New Brunswick.

Recommendation

- Current catheterization facilities are inadequate to cope with existing demand and the need for at least 50% of another facility that could be shared with an electrophysiology program is strongly recommended. Current wait lists should be minimized by extending catheterization laboratory hours of operation.

- Ongoing improvements to the transportation of patients between the regions and NBHC should be a priority. Consideration should be given to ensuring the ambulance service has paramedics trained at a level that would reduce the burden of transfer with Registered Nurse accompaniment required.

- The transport system should have ongoing data collection and an evaluation process in place to ensure the clear understanding of costs and benefits associated with the transfer of cardiac patients to the NBHC.

Appropriate Location of an Additional Catheterization Laboratory

A well-formulated proposal was reviewed from cardiologists in region 1 suggesting that an additional cardiac catheterization laboratory should be located in Moncton. The report first acknowledged the efforts to provide province-wide cardiac services at the NBHC. Nevertheless, the proposal suggested that an additional cardiac catheterization laboratory was required for many of the reasons indicated in the paragraphs above. The report put forward the following reasons why additional catheterization facilities were required.

- There has been a dramatic lengthening of the waiting list for cardiac catheterization in New Brunswick.
- There are well over 40 hospital patients each day awaiting transfer across the province.
- The average wait time for transfer of urgent patients is approximately 10 days and this has doubled over the last year
- At the Moncton Hospital between April and June 2003, 740 patient days were used waiting for transfer.

The proposal goes on further to suggest why a new facility should be sited in Moncton. The reasons included the following:

- Proximity to a catheterization laboratory determines cardiac catheterization rates. Thus in 2002-03 Region 2 had 36% more cases referred for catheterization than Region 1 (867 versus 636) despite a smaller population, potentially suggesting unfair access on the basis of geography.
- Dependence on transportation between regions is a significant issue and the combined direct cost for transportation is excessive
- Inefficient use of resources – the report suggests that establishing another cath lab at the New Brunswick Heart would require more intensive care and step down beds as well as additional staff. These resources already exist in Region 1 and would be freed up with more efficient utilization.
- Direct angioplasty in the setting of acute myocardial infarction is a well-accepted therapy and can only efficiently be offered in Moncton if there is a cardiac catheterization laboratory on site.
- Language – Patients and referring physicians in Region 1 would be served in the language of their choice.

The committee agrees that additional cath lab facilities are necessary to impact waiting lists and to improve cardiac care for the people of New Brunswick. The concerns around situating an additional cardiac catheterization laboratory in Moncton included the following:

- The geography of New Brunswick makes decentralization of catheterization laboratories difficult and cost inefficient. The manpower required to cover a decentralized laboratory 24/7 when the projected increased demand is an additional one half cath lab is significant. In addition, the cost of the non-utilized time is significant and represents funds that could be used to enhance other cardiac areas of need.

- Costs would be less and human and other health resources would be more efficiently deployed by adding to existing capacity at the NBHC rather than establishing a program de novo in Moncton.

- A freestanding cardiac catheterization laboratory in 2004 must provide PCI capability and must be prepared to provide direct angioplasty in the setting of acute myocardial infarction. Providing this service, especially on a 24/7 basis, requires the commitment of significant manpower and resources.

- Referral lines have already been well established for the program and increased resources and some restructuring should dramatically improve the triage process.

- The stable population projected for New Brunswick and the highly efficient utilization of current interventional cardiac resources suggests that for the foreseeable future a third full time cath lab facility is not warranted although a shared facility with electrophysiology would likely prove clinically efficient and cost effective. The NBHC is the obvious setting for such an electrophysiology program.

Recommendation

- It is recommended that existing cardiac catheterization facilities should be expanded at the NBHC as opposed to creating a new program elsewhere. Implementation of such an expansion must ensure that services are provided in the patient's language of choice.

Electrophysiology Services

Current Service Provision and Volumes

New Brunswick patients requiring specialized arrhythmia investigation or intervention, such as an electrophysiology study, catheter ablation of arrhythmogenic foci or insertion of an implantable cardiac defibrillator (ICD), have traditionally been referred to centres in Quebec or Halifax although a small number are now being managed in Newfoundland since the establishment of an electrophysiology service in that province.

It is difficult to ascertain both the number of New Brunswick patients receiving electrophysiology services and the price of their care. No information was available on the number and costs of ablative procedures performed out of province. Furthermore, while data were accessible on the number of patients receiving electrophysiology services and the medical costs associated with these, hospital charges were only available for all out of province services combined and hence it was impossible to discern the proportion accounted for by the electrophysiology services in particular. Information was obtained on out of province as well as in province pacemaker insertion; but this is not a procedure that requires expertise in electrophysiology. Data from Nova Scotia gives some sense of the numbers and costs of electrophysiology services. Thus, in fiscal 2002/03, 31 patients were managed in Halifax for pacemakers and another 45 for implantable defibrillators at a cost of $95,195.00 and $939,071.00, respectively.

The majority of electrophysiology services are provided to New Brunswick patients through the Division of Cardiology at the Queen Elizabeth II Health Sciences Centre (QEII HSC) in Halifax, which currently has three full time electrophysiologists on staff, working in a dedicated electrophysiology laboratory. The proportion of out of province patients managed in Halifax has been increasing each year. Currently, patients from New Brunswick, Prince Edward Island and Newfoundland and Labrador collectively make up the second largest patient cohort receiving electrophysiology services at the QEII HSC after residents of the Halifax Regional Municipality and its immediate environs. Another way of assessing this caseload is by recognizing that approximately ¼ of the out of province cases managed through the catheterization laboratories at the QEII HSC were for electrophysiology-related issues.

In fiscal year 2002/03, average wait times in Halifax were 34.4 weeks for non-urgent visits and 24.2 days for urgent outpatient referrals, approximately 9 months for elective ablation and about 1 month for ICD implantation. These waits have since ballooned such that current wait times at the QEII HSC (i.e., as of March 2004) are 44 weeks (308 days) for non-urgent visits and 14,9 weeks (104 days) for urgent assessment. There are no distinctions made between Nova Scotia patients and those from any other Maritime Province. While New Brunswick patients do not generally wait any longer for hospital transfers or for outpatient clinics, wait times for elective procedures are somewhat less on average for Nova Scotians. This is because Nova Scotia patients may be referred by local primary care physicians, mostly in the Halifax Regional Municipality (HRM), without going through another cardiologist or internist. As well, if cancellations occur on short notice, a patient on the wait list living nearby can be brought in faster than one living further away. This latter factor, however, in fact advantages patients predominantly living within the Halifax area to those from outside metro Halifax, whether in Nova Scotia or New Brunswick.

In summary, New Brunswick is very dependant upon Nova Scotia for an ever-expanding electrophysiologic service requirement. With wait lists growing ever longer in Halifax, arrhythmia management is being jeopardized for patients throughout the Maritime Provinces.

Predicted Volumes

Predicting the future need for electrophysiologic services in New Brunswick is complex. It is clear that in 2004 many issues including refractory or difficult to manage atrial fibrillation, patient selection for pacemakers including biventricular pacing for patients with heart failure, the ever-expanding selection of patients at risk for sudden death requires the expertise of electrophysiologists. Covering the continuum of cardiac care for citizens of New Brunswick requires an electrophysiology program at the New Brunswick Heart capable of dealing with these complex problems. To the extent that electrophysiologists do far more than electrophysiology studies, projecting human resource needs should not depend only on the number of such studies anticipated. Indeed, even pacemaker or ICD selection and follow-up would be expected to occupy a significant proportion of any electrophysiologist's time.

In anticipating future electrophysiology needs for New Brunswick, perhaps the most relevant document was one published by the Cardiac Care Network of Ontario in 2001 as they grappled with similar concerns relative to the province of Ontario [6]. The CCN panel identified numerous difficulties in developing targets for procedure rates or estimates of electrophysiologists needed per 100,000 population. These include the fact that implantation of pacemakers and the performance of electrophysiologic studies and even ablation remain somewhat discretionary. The indications for performing procedures are heterogeneous; and good regional data is lacking on the incidence and prevalence of conditions warranting these procedures [6]. Using historical utilization as a proxy measure of need was similarly felt to be problematic: current utilization in Canada is constrained by supply and may not reflect population need; few if any published data are available on the volumes of electrophysiological procedures, and the field is evolving rapidly with new studies constantly expanding the potential indications for most electrophysiological interventions [6]. While the CCN panel felt that it was outside their scope to develop specific criteria of need, the document nevertheless concluded that a referral base of 750,000 to one million persons seemed reasonable in terms of warranting consideration of an EP laboratory in a given community.

There has been a great deal of innovation in the diagnosis and treatment of electrical disturbances in recent years. There are currently four key invasive procedures used to diagnose, treat and/or cure cardiac arrhythmias. They include 1) permanent implantable pacemakers - for the most part this is occurring already within the province of New Brunswick. 2) Implantable cardioverter/defibrillators (ICD). 3) Electrophysiologic studies (EPS) in which a cardiac catheterization is employed to identify the site and type of arrhythmia by recording the electrical activity from within the heart. EPS studies are performed in procedure rooms and at many sites across Canada invasive cardiologists performing diagnostic cath and electrophysiologists performing EPS and ablation share laboratory facilities. 4)The final key invasive procedure is for (radiofreqency ablation). EPS is used to precisely define the nature of the cardiac arrhythmia and then radiofrequency catheters are used to ablate or destroy the arrhythmic tissue.

For the fiscal year 2002/03, the Cardiac Care Network of Ontario after reviewing jurisdictional rates from across Canada recommended a minimum target rate for EPS of 35 studies per 100,000 adults that should increase to a minimum of 41 per 100,000 adults in 2003/04. The minimum target for ablations was set at 21 per 100,000 adults in 2002/03 and 25 per 100,000 in 2003/04. The minimum target rates per 100,000 adults for pacemaker implantation were set at 84 in 2002/03 and 87 in 2003/04. The corresponding figures for ICD implants were 9.2 and 10.4 per 100,000 adult population [6]. The methodology for the development of these targets is well ou ned and available on the website of the Cardiac Care Network of Ontario.

In 2002/03 191 electrophysiologic studies were performed on patients from New Brunswick costing the province $120,212.00. Forty-five patients received a defibrillator-pacemaker at a cost of $1.5 million dollars. This review team suggests that these patients should be repatriated to an excellent electrophysiologic program established at the NB Heart.

Using the target volumes it is projected that a new program should perform 225 electrophysiologic studies, 120 ablations and 60 AICDs in the first year. It is understood that this is a very rapidly changing field with new indications constantly appearing for AICDs and ablation therapy.

The NBHC has no actual experience of its own with these types of procedures. The review team has used average times from other programs to project the needed laboratory time (Appendix F). These averages include: 2 hours for an electrophysiology study, 4 hours for an ablation and 2 hours for the insertion of an AICD. Using these figures the demand for laboratory time would be 1050 hours. This represents slightly more than .5 of a laboratory.

With these numbers it is suggested that half of a laboratory will need to be dedicated to an electrophysiologic testing, ablation, AICD and pacemaker insertion. However, it should be noted that even these are likely underestimates of future need given that cardiac electrophysiology is a rapidly evolving area and the potential growth in ablation procedures and implantable devices is staggering. There are new conclusive studies demonstrating the clinical benefits from prophylactic implantable cardioverter defibrillators (ICD) in patients with heart failure and the use of specialized pacemakers to resynchronize ventricular contraction and improve symptoms for this condition. If recommendations by the advisory panels in other provinces were applied to New Brunswick then there would be a need for an additional 208 prophylactic ICDs and a many as 68 specialized biventricular pacemakers for patients with left ventricular dysfunction.

It should be emphasized that very few jurisdictions are funding devices to this extent but the potential growth in electrophysiologic services is extremely significant. Another rapidly developing and technologically intensive area is the use of catheter ablation with or without a pacemaker to treat patients with atrial fibrillation. No recommendations have been drafted around minimum targets for ablation for this indication but, suffice it to say, this is another growth area given that atrial fibrillation, a condition that becomes more common with age, is anticipated to grow significantly more burdensome over the next generation.

Sufficient human resources must be in place so that a new electrophysiology program can be staffed with providers including technologists, nurses and physicians who have met all of the necessary training requirements. There are well-established "standards" for training in adult clinical cardiac electrophysiology endorsed by the Canadian Cardiovascular Society, which must be adopted by the NBHC or any program that will perform electrophysiology studies and ablations. A qualified electrophysiologist must be identified and recruited as the clinical director of the laboratory and within a very short period of time a second electrophysiologist will be required to make sure that someone is always available to provide appropriate clinical coverage. These electrophysiologists obviously could have significant clinical responsibilities outside electrophysiology. It is also important that appropriate resources are provided for the follow up of these patients after implantation of these complicated devices. Finally, another important manpower requirement is anesthesia, particularly with the implantation of AICDs and the need for more complex ablation procedures.

Recommendation

- The review committee recommends that the province of New Brunswick should provide its own cardiac electrophysiology service.
- A third multifunctional laboratory could be used 50% of the time to provide electrophysiologic services
- The search for an electrophysiologist to direct an electrophysiology program should begin in the near term and consideration should be given to hiring a second electrophysiologist soon thereafter
- The New Brunswick Department of Health and Wellness, working in concert with cardiovascular specialists and other experts, should develop minimum targets for electrophysiologic procedures and electrophysiologic implantable devices over the near and medium term. It is recommended that in the first full year this new program should perform 225 electrophysiologic studies, 120 ablations and implant 60 automatic implantable cardiac defibrillators. A cost analysis should be undertaken in expectation of this target volume.
- Budget impact planning needs to be started promptly to assess the imminent costs associated with rapidly expanding electrophysiological technologies.

V. REFERENCES

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VI. Appendices and Glossary

APPENDIX A

Terms of Reference

New Brunswick Cardiology Program Review Committee

Purpose

- To review cardiac care in New Brunswick and, to recommend, to the Minister of Health and Wellness, a model of service delivery which will ensure timely access to quality care to both linguistic communities.

Objectives

- Review existing clinical, technical, administrative and financial resources and processes currently in existence to support the program.
- Review best practices in general cardiology care, interventional cardiology and cardiac surgery.
- Forecast future needs for these services using, as a starting point, the information made available through previous studies of the program.

Deliverable

- A report presenting the findings of the review and identifying implementation options for a model of cardiac care for New Brunswick which will respect the following:
  - Provincial in nature and identifies desirable linkages and referral patterns within and amongst all Regional Health authorities (RHAs)
  - Serves both linguistic communities
  - Is in keeping with best practices in cardiac care
  - Is clinically and financially sustainable.
- The report should outline all resources and key processes including, but not limited to, care processes, wait time management, and linkages amongst RHAs.
- The report should also outline a mechanism to ensure the on-going management of the program

Membership

- Co-chairs: CEO of RHA2 and Executive Director, Hospital Services (DHW);
- 4 representatives from RHA2 to include a cardiologist, an interventional cardiologist and a cardiac surgeon.
- 1 representative from each of the seven other RHAs
- 2 cardiologists in addition to those from RHA 2
- 3 representatives from the Department of Health and Wellness(DHW)

Timeframe

- The report is to be submitted no later than March 31, 2004.

Resources

- The committee may use external consultants to assist in completing its mandate.

APPENDIX B

REVIEWED DOCUMENTS

Name of Document	Source
Acute MI and Cath Report 01/02	Provincial report
Patients with a Stay in CCU by Discharge Nursing Unit 00/01	Atlantic Health Sciences Corporation – Region 2 Saint John Regional Hospital
Patients with a Stay in CCU by Discharge Nursing Unit 01/02	Atlantic Health Sciences Corporation – Region 2 Saint John Regional Hospital
Patients with a Stay in CCU by Discharge Nursing Unit 02/03	Atlantic Health Sciences Corporation – Region 2 Saint John Regional Hospital
Patients with CCU stay by CMG with Dx and Px	Atlantic Health Sciences Corporation – Region 2 Saint John Regional Hospital
Discharges from 5AN 00/01;01/02;02/03	Atlantic Health Sciences Corporation – Region 2 Saint John Regional Hospital
Newly diagnosed AMI (initial episode) who received a cath/Health region of the individual 2001/02	HFUMS/Hospital Services
New Brunswick Balanced Scorecard	DHW
New Brunswick Utilization Management Retrospective Review 2001	DHW
Atlantic Health Database Part A – Determinants of Health	DHW
Cardiac Procedures Performed at Saint John Regional Hospital (April 2003 to present)	Medicare Services
Cardiac Procedures Performed at Saint John Regional Hospital 2002-2003	Medicare Services
Distinct Count for Patients treated at the Heart Health Centre (April 2003 to present)	Medicare Services
Distinct Count for Out of Province Patients Treated at the Heart Health Centre (April 2003 to present)	Medicare Services
Distinct Count for Patients treated at the Heart Health Centre (2002-2003)	Medicare Services
Distinct Count for Out of Province Patients Treated at the Heart Health Centre 2002-2003	Medicare Services
Medical Services for Patients receiving defibrillator-pacemaker (02-03 and 03-04)	Medicare Services
Summary of transfer data from step down unit for VITAL triage	Bathurst Health Authority
Population Estimates by age for both Sexes, New Brunswick Census Subdivisions	Statistics Canada
Regio 1 Cardiac Cath Lab Proposal	Cardiologists in region 1
Ambulance data	DHW

APPENDIX C

INDIVIDUALS AND GROUPS INTERVIEWED

Name	Position
Francine Bordage	Nurse Manager 3B South
Cleo Cyr	Program Coordinator CV Health and Wellness Program
Lynn Childs	Nurse Clinician NBHC
Sue Santawris	Nurse Manager Integrated ICU
Margaret Melanson	Administrative Director, Rehabilitation Services/Psycho Social Services
Krisan Palmer	Region Manager, Telehealth
Glen Gale	Administrative Director, Diagnostic Imaging
Reine Wojik	Region Manager, Laboratory Medicine
Patti Lively	Region Manager, ECG and Respiratory
Roy Steeves	Pharmacist (Acting for Moria Wilson)
Bill O'Reilly	Manager, Perfusionists
Dr. David Marr	Clinical Head, Cardiology NBHC
Jill Barton McPhee	Administrative Director NBHC
Judy Melanson	Nurse Manager CCU, Stepdown, Cath Lab
Cheryl Swan	Admin Director Surgery, ICU, Anaesthesia
Dr. V. Paddock	Clinical Head, Cardiac Intervention
Dr. James Parrott	Clinical Head, Cardiac Surgery
Meetings with Health Regions	
Site Meetings	Region 1, RHAs 1SE and 1B (Moncton Hospital and George Dumont Hospital) Region 2 – St. John Region 3 – Fredericton
Tele/video conference meetings	Region 3 – Region 5 – Region 6 – Region 7 -
Teleconferences:	Review of CCU data Review of medical services data

APPENDIX D

Cardiology diagnostic procedures by NB facility - 2002-03

Procedure Type	Facility
ECGs	Albert County Campbellton Regional Caraquet Carleton Memorial Chaleur Regional Charlotte County Dalhousie Dr Everett Chalmers Edmundston Regional Fundy Hospital Grand Falls Grand Manan Harvey Community Hôpital de Tracadie Hôpital Georges Dumont Hôpital Stella Maris Lameque MacLean Memorial Miramichi Hospital Moncton Hospital Oromocto Public Perth Andover Queens North Sackville Saint John Regional Saint Joseph's St Quentin Tobique Valley

Procedure Type	Facility
Echocardiograms	Campbellton Regional Chaleur Regional Dr Everett Chalmers Edmundston Regional Hôpital Georges Dumont Miramichi Moncton Hospital Saint John Regional
Trans-esophageal Echocardiograms	Campbellton Regional Edmundston Regional Hôpital Georges Dumont Moncton Hospital Saint John Regional
Nuclear Cardiology	Chaleur Regional Edmundston Regional Hôpital Georges Dumont Moncton Hospital Saint John Regional

Data Source: DHW

APPENDIX E

TIME REQUIRED FOR CATHETERIZATION AND PCI PROCDEDURE
Fiscal Year 05/06

Procedure	Projected volume	Time per case (hours)	Total time
Total catheterization	3585		
Catheterization only*	2407	1	2407
Total PCI	1309		
Adhoc PCI **	1178	1.8	2120
PCI only	131	1.6	210
Total			**4737**

* Cath only = Total cath – adhoc PCI
** Adhoc PCI = 90% of total PCI

AVAILABLE TIME PER CATH LAB

Lab hours	Hours per day	Hours per week	Hours in 48 weeks*	Hours in 50 weeks**
8 hour lab	8	40	1920	2000
10 hour lab	9.5	47.5	2280	2375

* 48 weeks (Closed for 10 statutory holidays and 10 days of downtime)
** 50 weeks (Closed for 10 statutory holidays)

REQUIRED LAB CAPACITY FOR FISCAL 05/06 PROJECTIONS

Required time	4737
Annual hours per lab	1920
Total labs	2.5

APPENDIX F

TIME REQUIRED FOR ELECTROPHYSIOLOGY PROCDEDURES

Procedure	Projected volume	Time per case (hours)	Total time
Electrophysiology study	225	2	450
Ablation	120	4	480
AICD	60	2	120
Total			**1050**

REQUIRED LAB CAPACITY FOR ELECTROPHYSIOLOGY PROJECTIONS

Required time	1050
Annual hours per lab	1920
Total labs	.5

APPENDIX G

TRIAGE MODEL

Patient Referral	- Predefined data for referral - Established mechanisms for Referral
Triage Process & Urgency Score	- Assignment of triage urgency score - Consistent use of score for triage and booking
Booking	- Booking of procedures - Ability to move based on symptom change
Outcome Tracking	- Data collection on outcomes while waiting - Procedure/results tracking
Reporting	- Outcomes - Access - Waiting times

GLOSSARY OF TERMS

Ad Hoc PCI: When the diagnostic cardiac catheterization and percutaneous intervention are performed at the same sitting.

Arrhythmia: A deviation from the normal pattern of the heartbeat either too fast, too slow or irregular.

Atrial Fibrillation (AF): An abnormally fast heart rhythm in which the atria are extremely fast chaotic and uncoordinated in their electrical activity.

Automatic Implantable Cardioverter Defibrillator (AICD): A device that can deliver large energy discharges (or shocks) to the heart to terminate a tachycardia. All modern AICDs are also able to function as regular pacemakers.

Catheter ablation (ablation): Procedure in which the abnormal cells causing an arrhythmia are destroyed generally using radiofrequency energy.

Coronary artery bypass graft (CABG): Open heart surgery in which a section of blood vessel is grafted onto one of the coronary arteries, bypassing a narrowing in the coronary artery.

Diagnostic Cardiac Catheterization: A diagnostic procedure in which a catheter is introduced into a large artery and threaded through the circulatory system to the heart in order to inject contrast material into the heart and to the coronary arteries which supply blood to the heart.

Drug eluding stent (DES): Stents are tubular metallic scaffolds which are positioned inside coronary narrowings following balloon angioplasty to support and prevent renarrowing. Drug eluding stents have chemicals impregnated in them which prevent renarrowing.

Electrophysiologic Study (EPS): An invasive test that uses cardiac catheterization to identify the site and type of arrhythmia by recording the electrical activity from within the heart chambers.

Acute Myocardial infarction (AMI): is death of a portion of a cardiac muscle caused by obstruction in the coronary artery.

Percutaneous Coronary Intervention (PCI): Encompasses PTCA (see below), coronary stenting and various other techniques such as atherectomy and thrombectomy.

Percutaneous Transluminal Coronary Angioplasty (PTCA): A technique in which a narrowing in an artery is flattened against the arterial wall by a balloon resulting in improved circulation. This procedure involves passing a catheter through the vessel to the area of narrowing, inflating and deflating a small balloon at the tip of the catheter and then removing the catheter.

Permanent Pacemaker: A small internal devices that delivers low energy electrical pulses to the heart in order to make the heart beat faster.

Primary PCI: PCI is now being used to open blocked arteries in patients with an evolving acute myocardial infarction (AMI). This process of opening the artery in the midst of a heart attack is know as primary or direct PCI. Its value is well established.